Assessing the Efficiency of TIF Programs: Cost-Benefit Analysis

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Outline

- What is cost-benefit analysis (CBA)?
- How does CBA differ from fiscal analysis?
- What are the essential elements of CBA?
- How can CBA be applied to TIF interventions?

What is cost-benefit analysis (CBA)?

- CBA is a protocol for systematically assessing alternative public policies in terms of their efficiency
  - Assess efficiency in terms of net benefits
  - Choose policies that would maximize net benefits
- CBA is comprehensive
  - It seeks to include *all* valued impacts
  - It gives "standing" to everyone in society
- CBA is prospective
  - What net benefits would result *if* a policy were adopted (including continuation or replication of existing program)?

Conceptual Foundations

- Willingness to pay
  - Policy impacts are valued in terms of individuals' willingness to pay to obtain or to avoid them
  - Benefits are the algebraic sum of these willingness-to-pay amounts
- Opportunity cost
  - What is the value of real resources (labor, etc.) in their next best uses?
  - Costs are the algebraic sum of the opportunity costs of the resources needed to implement the policy

How does CBA differ from fiscal analysis?

- Fiscal analysis includes only changes in government revenues and expenditures
  - Bottom line like that of private organization
  - Often not comprehensive across government units
- CBA includes all impacts valued by people with standing
  - Net revenues may be larger, smaller, or the same as social benefits

Differences between fiscal and social costs and benefits

- Expenditures may not equal opportunity costs
  - Distorted markets (monopoly rents, price changes)
  - Owned goods (administrative pricing of space)
  - Transfers to people (social benefit and social cost)
- Opportunity cost of tax revenue greater than revenue
  - Dollar of expenditure funded by taxes has social cost of (1+METB), where METB is the marginal excess tax burden
  - Net social cost of transfer of $T is not 0 or $T but $T*METB

    [social benefit = $T, social cost = $T(1+METB)]
  - Estimates of METB for property tax: 10 to 20 percent

What are the essential elements of CBA?

- Identify all relevant impacts
- Monetize all impacts with appropriate prices
  - Sometimes market prices
  - More often “shadow prices” that take account of distortions, especially missing markets
- Discount for time
- Take account of uncertainty
- Report net benefits

Identify Impacts (Comprehensively!)

- Measure impacts relative to status quo
- Real resources used (teacher, parent, administrator time; materials; space)
- Primary impacts from evaluation (student achievement, teacher morale, parental engagement)
- Secondary impacts
  - Student achievement -> increased probability of HS graduation, reduced delinquency and criminality, higher earnings, etc.

Monetize Impacts

- Undistorted markets with no price change---market price (pencils and books)
- Undistorted markets with price change---average of old and new price (skilled workers)
- Distorted markets---social surplus analysis (monopoly supplier)
- Missing markets---shadow prices from research (value of a high school degree)

Shadow Prices

- Direct valuation
  - Social cost of a crime: harm to victim and criminal justice system costs (fear of crime?)
  - Productivity gain from high school completion: present value of increased earnings over working life
- Vertical linkage
  - Student achievement->productivity gain
  - Reductions in child abuse->reductions in delinquency-> reduction in adult crime
- Horizontal linkage
  - Higher productivity->reductions in crime & improved fertility choice

Vertical linkage: Washington State Institute for Public Policy child abuse CBAs

- WSIPP did meta analysis to estimate impact of intervention programs on child abuse
- WSIPP did meta analysis of studies linking child abuse to reductions in probability of high school graduation (and other effects)
- Product of these impacts gives the predicted effect of the program on high school graduation
- The present value of increased earnings from high school degree, $175,000, was used as a shadow price for the predicted number of additional graduations resulting from the program

Horizontal linkage: shadow price to convert narrow, but readily measured, outcome to social benefit

- Example: Haveman and Wolfe (1984) household utility approach
  - Estimate non-labor market benefits of schooling (reductions in crime, efficiency of consumption)
  - Rule-of-thumb: non-labor market gains approximately equal to labor market gains
- Wolfe and Haveman (2001)
  - Additional affects: for example, fertility choices of daughters

How can CBA be applied to TIF interventions?

- Identify all impacts
- Monetize using shadow prices
- Take account of uncertainty with Monte Carlo Simulation

Example: Social benefits of increased student achievement

- Measure impact of TIF on student achievement
- Relate achievement to productivity gains
- Monetize benefits to student using present value of increase in earnings due to productivity gain
- Monetize benefits external to student using Wolfe & Haveman rule-of-thumb that these benefits are equal to private earnings

Give me some numbers! OK

- Hanusek (2004) literature review: one-standard deviation increase in mathematics performance at the end of high school increases annual earnings by 12 percent
- WSIPP meta-analysis estimate of annual decay in gain through completion of high school: 8 percent
- WSIPP uses Current Population Survey data to estimate earnings for those with attainment from 9th grade to some college
  - Age 18 to 65
  - Scale up using a fringe benefit rate of .423
  - Assumes average annual real rate of gain in earnings of .013

Estimating productivity benefit of a one-time increase of α standard deviations in test score in, say grade 5

- Using decay rate, project standard deviation increase at graduation
  - $\alpha_{HS}=\alpha/(1+.08)^{(12-5)}= \alpha/(1+.08)^{7}$
  - Annual productivity gain = .12 α_{HS}
- Project annual average earnings (taking account of non-workers and productivity growth) in year i: $earn_i$
- Convert to full wage using fringe rate of .423: $EARN_i=(1+.423)earn_i$

(continued)

- Calculate annual productivity gain:

  $\Delta EARN_i = .12\ \alpha_{HS} EARN_i$

- Following Haveman and Wolfe assume external benefits equal productivity gains to get annual social benefits:

  $SocBen_i = 2\Delta EARN_i$

(continued)

- Calculate the present value of benefits using a social discount rate of d:

- $PVSocBen=\sum SocBen_i/(1+d)^{(i\text{-age at grade 5})}$

  where $\sum$ means sum from i=18 to i=65

Implementing this Procedure

- Use WSIPP average earnings and fringe benefit figures (Aos et al. 2007, 22)
- Convert to current year dollars using the CPI calculator at http://www.bls.gov/data/inflation_calculator.htm
- Use the α from your evaluation!

Some Issues Relevant to Costs

- Starting point: changes in wages and fringe benefits are program cost
- Possible complications:
  - Some incentives rent? (then transfers so METB times rent, rather than rent, the opportunity cost)
  - Induced turnover? (then take account of costs of replacement)

Taking account of uncertainty

- Sensitivity analysis: systematically vary assumptions
- Better approach: Monte Carlo simulation
  - Assume distributions for all uncertain parameters)
  - Calculate net benefits with random draws of all uncertain parameters
  - Repeat process to generate many estimates of net benefits
  - Display and analyze distribution of net benefits

Conclusion

- CBA takes some intellectual courage in moving from your estimates of impacts to social net benefits---be brave!
- Use WSIPP analyses as models
  - High quality analyses
  - Results have influenced state legislature

Citations

- Steve Aos, Marna Miller & Jim Mayfield (2007) Benefits and Costs of K-12 Educational Policies: Evidence-Based Effects of Class Size Reductions and Full-Day Kindergarten. Olympia, WA: Washington State Institute for Public Policy, Document No. 07-03-2201.
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